IN THE CLAIMS:

1. (Previously Amended) A direct injection fuel injector having a fuel inlet, a fuel outlet, and a fuel passageway extending from the fuel inlet to the fuel outlet along a longitudinal axis, the fuel injector comprising:

a body having an inlet portion, an outlet portion, a neck portion disposed between the inlet portion and the outlet portion, the neck portion including a metallic cylindrical annulus that provides a body passage extending from the inlet portion to the outlet portion along the longitudinal axis of the fuel injector;

an armature proximate the inlet portion of the body;

a cylindrical needle operatively connected to the armature;

a seat disposed at the outlet portion of the body; and

a swirl generator proximate the seat and having a generally constant cross-section between an outer perimeter and a central aperture, the swirl generator having a guide disk contiguous to a flat disk;

wherein the cylindrical annulus of the body includes an inner diameter that is greater than a diameter of the cylindrical needle so as to define the body passage, which maintains an operative relationship between the body and the needle when the body is exposed to operating temperatures of a cylinder of an engine.

2. (Original) The fuel injector of claim 1, wherein the inner diameter of the cylindrical annulus is no more than 50% greater than the diameter of the cylindrical needle, and an outer diameter of the cylindrical annulus is no less than 100% greater than the inner diameter of the cylindrical annulus.

3. (Currently Amended) A direct injection fuel injector having a fuel inlet, a fuel ~~outlet, and a~~ fuel passageway extending from the fuel inlet to the fuel ~~outlet~~ along a longitudinal axis, the fuel injector comprising:

a body having an inlet portion, an outlet portion, a neck portion disposed between the inlet portion and the ~~outlet~~ portion, the neck portion including a metallic cylindrical annulus that

provides a body passage extending from the inlet portion to the outlet portion along the longitudinal axis of the fuel injector;

an armature proximate the inlet portion of the body;

a cylindrical needle operatively connected to the armature;

a seat disposed at the outlet portion of the body, the seat having a first surface intersecting a second surface, the first surface generally perpendicular to the longitudinal axis and the second surface generally oblique to the seat and adapted to engage the needle in an unactuated position of the needle; and

a swirl generator contiguous to the first surface of the seat, the swirl generator having a guide disk contiguous to a flat disk;

wherein the cylindrical annulus of the body includes an inner diameter that is greater than a diameter of the cylindrical needle so as to define the body passage, which maintains an operative relationship between the body and the needle when the body is exposed to operating temperatures of a cylinder of an engine, and wherein the seat includes ~~a~~ the first surface exposed to the fuel passageway and a ~~second~~ third surface exposed to an exterior of the fuel injector, the first surface being spaced from the ~~second~~ third surface a defined distance along the longitudinal axis, the first surface having at least one cut-out configuration that extends for a fraction of the defined distance into an interior of seat.

4. (Original) The fuel injector of claim 3, wherein the at least one cut-out comprises at least one volume that defines at least one wall that is located between the first surface and the second surface.

5. (Original) The fuel injector of claim 4, where the at least volume comprises one of a plurality of volumes and a channel.

6-9. (Previously Canceled Without Prejudice or Disclaimer)

10. (Previously Amended) A fuel injector having a fuel inlet, a fuel outlet, and a fuel passageway extending from the fuel inlet to the fuel outlet along a longitudinal axis, the fuel injector

comprising:

a body having an inlet portion, an outlet portion, and a body passage extending from the inlet portion to the outlet portion along the longitudinal axis;

an armature proximate the inlet portion of the body;

a needle operatively connected to the armature, the needle includes a curved surface that engages with a conical end of the funnel to inhibit fuel flow through the seat passage of the seat;

a swirl generator proximate the needle, the swirl generator comprises at least one flat disk, the at least one flat disk includes:

a guide disk having a perimeter, a central aperture, and at least one fuel passage opening between the perimeter and the central aperture; and

a swirl disk having at least one slot extending tangentially from the at least one fuel passage opening to the central aperture;

a seat protruding from the outlet portion of said body, the seat including a first surface exposed to the body passage and a second surface exposed to an exterior of the fuel injector, the first surface being spaced from the second surface a defined distance along the longitudinal axis, the first portion having at least one cut-out configuration that extends from the first surface for a fraction of the defined distance into an interior of seat wherein the at least one cut-out comprises at least one volume that defines at least one wall in the interior of the seat, the at least one volume comprises one of a plurality of volumes and a channel, wherein the seat includes a seat passage, the seat passage including a funnel extending between the first surface and the second surface.

11. (Original) The fuel injector of claim 10, wherein the at least one fuel passage opening comprises a plurality of fuel passage openings between the perimeter and the central aperture; and the at least one slot of the swirl disk comprises a plurality of slots that corresponds to the plurality of fuel passage openings in the guide disk.

12. (Original) The fuel injector of claim 11, wherein the at least one volume comprises a plurality of volumes arranged in the first surface to correspond to the plurality of fuel passage openings.

13. (Original) The fuel injector of claim 12, wherein each of the plurality of volumes comprises a cylindrical volume having a first diameter, and wherein the each of the plurality of fuel passage openings comprises a circular aperture having a second diameter, the first diameter being substantially equal to the second diameter.

14. (Original) The fuel injector of claim 13, wherein the at least one wall defined by each of the cylindrical volumes comprises a cylinder side wall and a cylinder end wall in the interior of the seat.

15. (Original) The fuel injector of claim 14, wherein the cylinder end wall is located between the second surface and a midpoint along the define distance from the first surface and the second surface.

16. (Previously Amended) The fuel injector of claim 10, wherein the channel comprises a width on the first surface, and wherein each of the plurality of fuel passage openings comprises a circular aperture with a diameter, the diameter of one of the fuel passage openings being substantially equal to the width of the channel.

17. (Original) The fuel injector of claim 16, wherein the channel comprises a continuous channel, and wherein the at least one wall defined by the continuous channel comprises an inner side wall, an outer side wall, and a channel end wall engaging both the inner side wall and the outer side wall.

18. (Original) The fuel injector of claim 17, wherein the channel end wall is located between the second surface and a midpoint along the define distance from the first surface and the second surface.

19. (Previously Amended) The fuel injector of claim 10, wherein the body comprises a neck portion, the neck portion including a cylindrical annulus that surrounds the needle, the needle

being a substantially cylindrical needle; and

wherein the cylindrical annulus comprises an inner diameter and an outer diameter, the inner diameter that is no more than 50% greater than a diameter of the cylindrical needle, and an outer diameter that is no less than 100% greater than the inner diameter.

20. (Previously Canceled Without Prejudice or Disclaimer)

21. (Withdrawn Per Restriction Requirement) A method of stabilizing temperature of a direct injection fuel injector, the direct injection fuel injector having a body and a neck portion; an armature proximate an inlet of the body; a needle operatively connected to the armature; a seat disposed at the outlet of the body; and a swirl generator proximate the seat, the method comprising:

providing the needle with a substantially uniform cross-sectional area and the neck portion with a metallic cylindrical annulus, the metallic cylindrical annulus having an outer surface with a first section and a second section of a substantially constant outer diameter with a annular member disposed between the first and second sections; and

selecting the metallic cylindrical annulus to surround the needle and to form a body passage having an average cross-sectional area of less than 2.25 times the substantially uniform cross-sectional area of the needle, the body passage maintaining an operative relationship between the body and the needle so that fuel in the body passage transfers heat from the body to the needle to maintain a minimum temperature gradient and to maintain an operative relationship between the body and the needle when the body is exposed to operating temperatures of an engine cylinder.

22. (Withdrawn Per Restriction Requirement) The method of claim 21, wherein the step of providing further comprises providing a substantially cylindrical member as the needle, and a cylindrical annulus as a neck of the body, the cylindrical annulus having an inner diameter that is no more than 50% greater than substantially uniform diameter of the substantially cylindrical member, and an outer diameter that is no less than 100% greater than the inner diameter.

23. (Withdrawn Per Restriction Requirement) The method of claim 22, further comprising:

providing the seat with a first surface exposed to the fuel passageway and a second surface exposed to an exterior of the fuel injector; and

configuring at least one cut-out in the first surface to form a wall that extends into an interior of seat.